567.3 FT³ W/OUT SLEEP STATIONS A/L OUT

STS Volume Question

402.6 FT³ – STOWAGE

443.5 FT³ – A/L (IN)

Volumes of habitable area

278.8 – STOWAGE & A/L(IN)

AirLock	123.8	+ 153.1 FT³ FLIGHT DECK
A/L Tunnel	39.8	
MidDeck	402.6	
Flight Deck	123.00	

We do not have validated dimensions for the interior of the airlock (A/L) and the airlock tunnel. Therefore, the actual volume is less than those given above for the A/L and A/L tunnel, which are for the outside dimensions.

The middeck volume takes into account 7 stowage bags, 4.5 airlock-out large bags, and 2 EMUs. Those items that are documented and have specific dimensions. Equipment, such as computers, loose cables, etc. as seen in the attached photograph have not been counted.

Usable volume for STS-91 is :

with 6 crew up -	123.2 cubic feet per person
with 7 crew down -	105.6 cubic feet per person

The volume for a ten-day mission has a threshold of acceptable volume of 135 cubic feet per person
The volume for a ten-day mission has a threshold of unacceptable volume of 50 cubic feet per person.
Both the up and down volumes fall into the area of doubtful acceptability where impairment tends to increase with reduction in volume and increased duration of exposure.

Frances Mount, Ph.D
July 10, 1998

+ DEPENDENT ON CONFIG.
– GALLEY
– SLEEP STATION
– STOWAGE

+ ORBITERS DIFFER

Graphics Research and Analysis Facility (GRAF)
Memo
FUR 072.1998

FLIGHT CREW SUPPORT DIVISION

PLAID

Subject: Middeck Volume Analysis

Date: 01 July 1998

To: F. Mount /x33723

Signature of Originator:

Lorraine M. Hancock

Comments:

The GRAF was requested to calculate the volume in the middeck, without sleep stations, with the airlock OUT configuration, and with and without stowage bags and EMU hardware. The volume of the middeck was calculated from three–dimensional coordinates of the open spaces of the GRAF's computer model of the middeck. The total available middeck volume without sleep stations and with the airlock OUT configuration was found to be 567.3 ft^3.

The volume of the 4.5 airlock out large bags and the 7 stowage bags was computed from data provided with the FUR. The volume of the EMU hardware was calculated from GRAF's three–dimensional computer model of the suit. The combined total volume of the 4.5 airlock out large bags, 7 stowage bags, and 2 EMUs was found to be 164.7 ft^3.

Therefore, the available middeck space with the airlock OUT configuration with all the stowage and EMU equipment listed above, but without sleep stations, is: 567.3 ft^3 – 164.7 ft^3 = 402.6 ft^3.

An illustrations demonstrating 95th percentile American male crewmembers working in the available space has been provided.

In addition to the middeck volume, the GRAF was requested to compute the volume of the flight deck. As with the middeck volume, the volume of the flight deck was calculated from three–dimensional coordinates of the open spaces of the GRAF's computer model of the flight deck. **The total available flight deck volume with all four crew seats installed was found to be 153.1 ft^3**, whereas **the total available flight deck volume with only the CDR and PLT seats installed was found to be 173 ft^3.**

Please call if you have any questions --

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MIDDECK VOLUME ANALYSIS (AIRLOCK OUT CONFIGURATION), INCLUDING: 4.5 AIRLOCK OUT LARGE BAGS, 7 STOWAGE BAGS, & 2 EMUs (*no sleep stations*)

AVAILABLE VOLUME = 402.6 ft^3